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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/625,094	07/25/2000	Frederick M. Discenzo	00RE089	6257

7590 03/15/2006

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EXAMINER

LEE, HWA S

ART UNIT PAPER NUMBER

2877

DATE MAILED: 03/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.



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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 09/625,094  
Filing Date: July 25, 2000.  
Appellant(s): DISCENZO, FREDERICK M.

**MAILED**

**MAR 16 2006**

**GROUP 2800**

Himansu S. Amin  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 11/30/04 appealing from the Office action  
mailed 6/16/04.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

5,399,854	Dunphy et al.	3-1995
5,361,130	Kersey et al.	11-1994
4,460,893	Thomas et al.	7-1984
5,382,097	Ide	1-1995
5,473,428	Lee et al.	12-1995

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 1-12, 14-21, and 24-27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunphy, *et al.* (US 5,399,854) in view of Kersey, *et al.* (5,361,130) and Thomas, *et al.* (4,460,893).

Dunphy, *et al.* show an embedded optical sensor capable of strain and temperature measurement comprising:

a least one optical fiber (21) embedded in a sample to be measured, the at least one optical fiber being adapted to transmit light from a light source; and

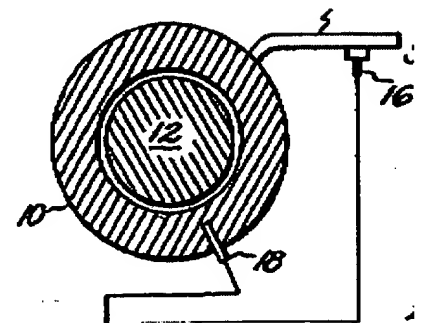
an interferometric system (28) operatively couple to the optical fiber;

wherein the interferometer system provides information relating to at least one condition of the sample, and a state of the at least one condition of the sample based on the information is determined.

Dunphy, *et al.* do not expressly show a processor and do not show that the sample being measured is a bearing.

Kersey, *et al.* show a fiber optic sensing system having a processor. At the time of the invention, one of ordinary skill in the art would have used a processor with Dunphy, *et al.* in order to count and convert the fringe signals from the sensors into the temperature that is being indicated by the sensor.

As for the bearing, Thomas, *et al.* show a sensor (18) embedded in a bearing (10) to monitor the bearing temperature wherein in the sensor (18) is embedded parallel to the direction of wear of the bearing (10).



At the time of the invention, one of ordinary skill in the art would have replaced the sensor of Thomas, *et al.* with the fiber optic sensor of Dunphy, *et al.* in order to have

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a simpler sensor having a wider range of temperature measurement, and also measures temperature more accurately.

As for **claims 2, 10, and 16**, Thomas, *et al.* show that monitoring the temperature of the bearing indicates the rate of wear of the bearing (Abstract).

As for **claims 4 and 5**, Dunphy, *et al.* show that a reference beam and a measurement beam is created and that an interference beam is created by the reflected reference and measurement beam.

As for **claims 8 and 9**, none of the cited reference show that the bearing is a ball bearing, hydrodynamic, double row ball, and thrust bearings however, those types of bearings are notoriously well known. At the time of the invention, one of ordinary skill in the art would have used sensors in ball bearings to monitor the condition of the bearings.

As for **claim 15**, please see Figure 7 of Kersey, *et al.*

As for **claim 16**, none of the references show that the sensor end of the fiber is flush with a contacting surface of the bearing, however, Thomas, *et al.* teach that the sensor should be placed as close as possible to the load bearing point, therefore one of ordinary skill in the art would have been motivated to place the sensor flush with the

contacting surface of the bearing since that point is a load bearing point in order to obtain the most accurate measurement of the temperature of the load bearing point.

3. **Claims 13, 27, 37-43** are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunphy, *et al.*, Kersey, *et al.* and Thomas, *et al.* as applied to claims 1-12, 14-21, and 24-27 above, and further in view of Ide (5,382,097).

Dunphy, *et al.*, Kersey, *et al.* and Thomas, *et al.* show all the elements but do not show an actuator.

Ide shows a smart bearing comprising an actuator. At the time of the invention, one of ordinary skill in the art would have modified Dunphy, *et al.*, Kersey, *et al.* and Thomas, *et al.* with an actuator of Ide in order to maintain proper bearing support while monitoring the pressure environment of the sensor (column 17, lines 47+).

#### **(10) Response to Argument**

1. Applicant's arguments regarding claims 1-12, 14-21, and 24-27

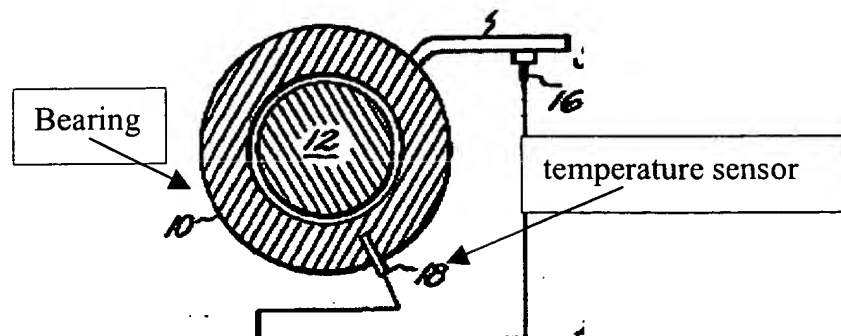
In response to Applicant's argument that neither Dunphy, *et al.* nor Kersey, *et al.* show a motivation to be combined (Applicant's Appeal Brief, page 4), the Office submits that the motivation to combine is within the knowledge generally available to one of ordinary skill in the art. It is within the knowledge generally available to one of ordinary skill in the art that interferometric fiber optic temperature sensors have advantages over thermocouple temperature sensors. Some advantages are: better immunity to detrimental electromagnetic fields, higher accuracy, and wider measuring

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range. To demonstrate that this knowledge is generally available to one of ordinary skill in the art, Lee *et al.* (US 5,473,428) show an interferometric fiber optic sensor and states,

“A thermocouple or resistive temperature detector (i.e., RTD) is typically used for general methods of electrically measuring the temperature of heat-emitting objects, objects within a hot environment or an ambient temperature of a hot (i.e., beyond room temperature) environment. Temperature measuring meters using such above methods have problems however, with electromagnetic interference (EMI), accuracy, response speed, and resolution. Also, there is a problem in that high temperatures are not easily measured. To solve many of the problems associated with the above mentioned temperature measuring means, an interferometric temperature measuring method has been developed.”

With this knowledge, the Office submits that it would have been obvious to combine Dunphy, *et al.* and Thomas, *et al.* Thomas, *et al.* show a bearing (10) wherein a thermocouple temperature sensor (18) is embedded in the bearing (10) to measure and monitor the temperature of the bearing (10). Shaft (12) rotates inside the bearing (10) within a layer of oil, and the lack of the lubricating layer of oil can cause the temperature of the bearing to increase.



Dunphy, *et al.* show an interferometric fiber optic temperature sensor. Dunphy, *et al.* however does not show every possible sample that can be measured by the fiber optic



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temperature sensor. Since Thomas, *et al.* show the motivation to measure the temperature of a bearing, one of ordinary skill in the art would have used the fiber optic temperature sensor of Dunphy, *et al.* to measure the temperature of a bearing and in particular, replaced the thermocouple temperature sensor of Thomas, *et al.* with the fiber optic temperature sensor since it is within the knowledge generally available to one of ordinary skill in the art that interferometric fiber optic temperature sensors have advantages over thermocouple temperature sensors such as higher accuracy, better immunity to detrimental electromagnetic fields, and a wider measuring range.

Applicant argues that the combination of Thomas, *et al.* and Dunphy, *et al.* would not yield a simpler system (Applicant's Appeal Brief, page 7) because the multiple layers and filaments must be incorporated. The Office agrees with the Applicant and withdraws the motivation "for a simpler system" but maintains that "more accurate measurements" and "wider temperature range" are motivations to combine Thomas, *et al.* and Dunphy, *et al.*, these motivations being generally known to one of ordinary skill in the art as demonstrated by Lee, *et al.*

It appears that the Applicant is arguing it would be problematic to embed the sensor of Dunphy, *et al.* in the bearing (Applicant's Appeal Brief, page 6, first full paragraph) because bearings do not already contain the multiple layers and filaments. In response, the Office was not looking to Thomas for the teaching a bearing having layers and filaments. Rather, Dunphy, *et al.* teach that the sensor as a whole is a combination of a fiber optic within a composite structure, the composite structure having layers with

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filaments. The Office submits that one of ordinary skill would embed the sensor in its entirety in the sample to be measured, the sensor comprised of an fiber optic within a composite structure. In the instant case, the sample being a bearing. Thus, the sample (bearing) does not need layers and filaments. If the sensor of Dunphy, *et al* can only be used to measure samples that have layers and filaments as the Applicant suggests, there would be very few, if any, samples which can be measured. The Office submits that the sensor of Dunphy, *et al.* is not solely an optical fiber, but rather that the sensor is an optical fiber in combination with a composite structure.

Applicant argues that the cited references do not disclose *an end of an optical fiber being flush with a contacting surface of a bearing*. The Office submits that one of ordinary skill would have placed the fiber optic sensor flush with the contacting surface of a bearing in order to obtain an even more precise temperature measurement of the bearing. Thomas, *et al.* show that the thermocouple temperature sensor should be placed close to the maximum load bearing point (contacting surface of the bearing) in column 3, lines 30-33. The Office submits that a skilled artisan would understand from this teaching of Thomas, *et al.* that the closer the temperature sensor is to the contacting surface, the higher the precision in measuring the critical temperature of the bearing. One of ordinary skill in the art would understand that the further away the sensor is from the contacting surface, the more there would be a delay in the measurement of any temperature change of the bearing in addition to possibly getting the wrong temperature of the load bearing point. With this understanding, the Office submits that one of ordinary skill in the art would be motivated to place the temperature sensor flush at the

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contacting surface in order to measure the temperature as accurately and timely as possible.

The Applicant also argues that the skilled artisan would not have placed the thermocouple sensor flush with the surface because the wearing away of the junction of the thermocouple would render the sensor useless. The Office agrees that once the junction has worn away enough, the sensor would be rendered useless, however one of ordinary skill in the art would recognize the compromise necessary between sensor longevity and sensor accuracy and would have selected the location of the sensor accordingly. In the situation where temperature accuracy is desired, the skill artisan would have placed the sensor immediately (flush) at the contact surface and would have done so with either the thermocouple temperature sensor or the fiber optic temperature sensor.

2. Applicant's arguments regarding claims 13, 27, and 37-43.

In response to Applicant's argument that Ide fails to show or to suggest an optical fiber embedded in a bearing, the Office was not relying on Ide for the teaching, but rather the combination of the teachings of Thomas, *et al.* and Dunphy, *et al* to obtain *an optical fiber embedded in a bearing*.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

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For the above reasons, it is believed that the rejections should be sustained.

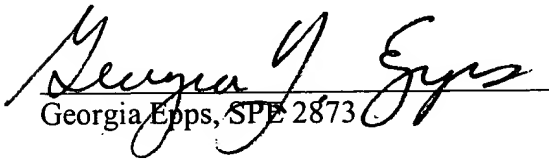
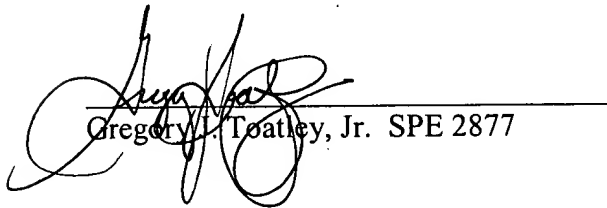
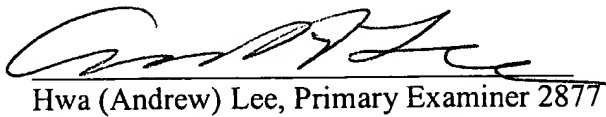
Respectfully submitted,



Hwa (Andrew) Lee, Primary Examiner 2877

January 12, 2006

Conferees:

  
Georgia Epps, SPE 2873  
Gregory W. Toatley, Jr. SPE 2877  
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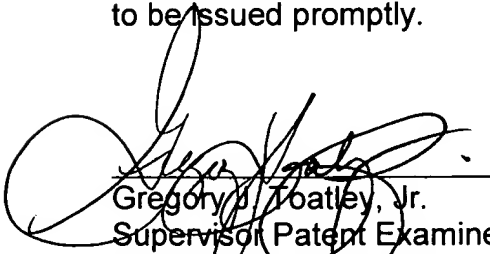
*In re* Application of Frederick M.  
Discenzo  
Application No.: 09/625,094  
Filed: July 25, 2000  
Title: SYSTEM FOR MONITORING BEARING  
WEAR

**WITHDRAWAL Previous  
Action**

The previous action, an Examiner's Answer mailed February 25, 2005, has been withdrawn in light of the fact that it was drafted under an old format (37 CFR § 1.192 (c)). 37 CFR § 1.192 was abolished on September 13, 2004, and has been replaced by 37 CFR § 41.37, and as such the answer should have been drafted under the new 37 CFR section. A new answer in compliance with the new regulations has been drafted and included with the mailing of this letter.

Telephone inquiries should be directed Gregory J. Toatley, Jr., Supervisory Patent Examiner, at (571) 272-2059.

The examiner will notify applicant of the new status of this application in an Office action to be issued promptly.

  
\_\_\_\_\_  
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